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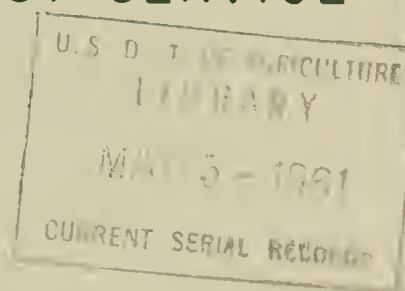
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# TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION  
U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE

No. 601

Comparison of Bulk Density of Soil  
in Abandoned Land and Forest Land



Bulk density is an important indicator of the water relations of soils. Low bulk density signifies a porous condition usually associated with high infiltration and high detention of water. Within a single soil type, this factor is influenced by the amount of macro-pore space and organic matter. These in turn are influenced largely by land use.

Bulk density measurements were taken under two different land-use conditions on the Coulee Experimental Forest in southwestern Wisconsin--open land and forest land. Both were on Dubuque silt loam, a common loessal soil of the Driftless Area of southwestern Wisconsin and adjoining Minnesota and Iowa. The open land had been used as a farm garden for many years and then abandoned. The forest land was a moderately stocked stand of native oak-hickory sawtimber. As far as could be determined, it has never been trampled by domestic animals.

At the time of sampling, the garden plot had been abandoned for at least 2 years. It was covered with a dense growth of grasses and alfalfa. The forest plot had a normal accumulation of hardwood leaf litter and a duff-mull humus layer about 2 inches thick. Both are on slopes of about 5 percent.

Soil samples were taken by 3-inch layers down to a 24-inch depth; the core sampler used was 2-3/8 inches in diameter by 2-3/4 inches in length. The number of samples taken per layer in each plot at each location is given in table 1 as are also the mean bulk densities.

The much lower bulk density in the surface (0- to 3-inch) layer under forest cover has been frequently observed by others; it is due to the accumulation of forest humus. The surface 0 to 3 inches is often considered the critical horizon in watershed management research. It is interesting, however, that the plowed area, which was subsequently abandoned, showed a lower bulk density in the 3- to 9-inch zone than did the forested area. This is probably the result of plowing and later invasion by grass and alfalfa.

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Table 1.--Bulk densities and differences on forest  
and open-land plots, by depth classes

Depth class (inches)	Number of samples		Mean bulk density		
	Open	Forest	Open	Forest	Difference
0 - 3	12	12	1.08	0.70	0.38**
3 - 6	12	12	1.07	1.22	.15**
6 - 9	12	8	1.26	1.36	.10
9 - 12	12	8	1.40	1.37	.03
12 - 15	8	8	1.44	1.43	.01
15 - 18	8	8	1.48	1.46	.02
18 - 21	8	8	1.54	1.49	.05*
21 - 24	8	8	1.56	1.52	.04

\*\*Difference is significant at the 1-percent level.

\*Difference is significant at the 5-percent level.